The Dow Chemical Company
Midland, MI 48674

August 23, 2013

Ms. Mary Logan
Remediation Project Manager
U.S. Environmental Protection Agency, Region 5
77 West Jackson
Chicago, IL 60604

Re: Segment 3-7 Bank Characteristic Survey Work Plan
Settlement Agreement No. V-W-10-C-942
The Tittabawassee River/Saginaw River & Bay Site
Dow Submittal Number: 2013.056

Ms. Logan:

Attached please find the Segment 3-7 Bank Characteristic Survey Work Plan (Work Plan). The Work Plan was developed as part of the Administrative Settlement Agreement and Order on Content (AOC) AOC CERCLA Docket No. V-W-10-C-942 and Appendix A, Section 8 of Statement of Work (SOW) of the Settlement Agreement.

Please let me know if you have any questions.

Sincerely,

Todd Konechne
The Dow Chemical Company
Project Coordinator

CC: Al Taylor, MDEQ
Diane Russell, U.S. EPA
Joseph Haas, U.S. Fish and Wildlife
Steve Lucas, Dow
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Segment 3-7 Bank Characteristic Survey Work Plan

The Tittabawassee River/Saginaw River & Bay Site

Prepared by:
The Dow Chemical Company

Date:
August 23, 2013
Revision 0
Dow Document Number: 2013.056

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1 Introduction

This Work Plan describes field investigations to be conducted in 2013 and 2014 to collect data to further characterize the banks in Segments 3 through 7 of the Tittabawassee River.

2 Segments 3 – 7 Bank Characteristics Survey

The objective of the bank characteristics survey described in this Work Plan is to collect detailed, bank-specific stability information in Segments 3 through 7. To accomplish this objective, field surveys will be completed to record data from transects within each individual bank survey areas/unit. Bank survey units will be identified in the field based on contiguous banks with similar height, bank slope and/or vegetative cover as described below.

The data to be recorded at each bank survey unit will include:

- Bank angle using laser range finder
    - The bank angle will be calculated from multiple data points (minimum of 5) taken from the bottom of the bank at the water surface to the top of bank
- Shape of bank
- Presence of undercutting (low, medium, high)
- Presence of exposed woody vegetation roots (low, medium, high)
- Percent cover of herbaceous species
- Species composition
- Overall visual characterization of bank stability (moderate to high stability, low stability, or undetermined)

The specific boundaries of the bank survey units will be identified in the field prior to collecting the percent cover or bank characteristic data based on distinct changes in key bank characteristics, such as bank height, bank angle and/or vegetative cover. That is, a specific bank survey unit will end and a new bank unit will begin when there is a distinct change in one or more of those characteristics. Based on work completed in Segment 2 in 2012, individual bank survey units are expected to vary in length from less than 100 feet to more than 1,000 feet.

Transects will be spaced based on the length of each bank survey area as follows:

- Bank survey areas from 0 to 100 feet
    - Minimum of 1 transect centered on bank section
- Bank survey areas from 100 to 500 feet
    - 2 to 3 transects per bank section
- Bank survey areas from 500 to 1000 feet
    - 4 to 5 transects per bank section
- Bank survey areas greater than 1000 feet
    - 1 transect a minimum of every 250 feet

Survey Methods

Surveys will be conducted by boat. At each transect location within a given bank unit, the boat will stop at the shoreline and the data described below will be recorded on the field data forms shown on Figure 1. Percent cover and species composition will be collected during peak growing season (mid-July through mid-September). The remaining survey parameters will be collected during leaf-off conditions to allow visual observation of the underlying bank.

The following information will be recorded:

Peak Growing Season

1. GPS location of each transect.
2. Percent cover of herbaceous species based on visual observation, from the toe to the top of bank.
3. Names of the dominant herbaceous, understory and overstory, species to genus (or species when possible).

Leaf-Off Condition

1. GPS location of each transect.
2. Shape of bank – the shape most representative of the entire bank segment.
3. Presence of undercutting – the relative degree of undercutting present at the bank compared to other banks being evaluated.
    a. The location of the undercutting (i.e., at the toe or mid-bank).
    b. The relative degree of undercutting (high, medium or low).
    c. Whether the undercutting appears to be recent or older.
4. Presence of exposed woody vegetation roots - the relative degree of exposed roots present at the bank compared to other banks being evaluated.
    a. The level of exposed roots (high, medium or low).
    b. Whether the root exposure appears to be recent or older.
5. Based on visual observation, note whether the bank appears to be high to moderate stability or low stability. If the stability of the bank is not easily discerned through visual observation, the bank will be noted as undetermined.

After the data listed above are collected, the boat will be moved offshore to approximately mid-channel and spudded down. The following additional information will be recorded:

1. Digital photograph of the bank segment area characterized.

2. Using a Atlanta Laser Advantage R CI (or similar), the distance and angle to the:
    a. Water surface at the toe of the bank
    b. Bankfull bench
    c. Between bankfull bench and top of bank
        i. One or more points will be surveyed based on the height of the bank
    d. Top of bank

3 Interpretation

The data described in Sections 2 and 3 will be evaluated in combination with other lines of evidence (e.g., bank pin data, model results) to characterize the overall relative stability of banks in Segments 3 through 7. Upon completion, preliminary results of the bank characterization study will be discussed between the Agency and Dow at future technical meetings.

4 Schedule

The bank characteristic survey activities will take approximately 3 to 4 weeks to complete depending on field conditions. The surveys will be separated into the growing season and leaf-off conditions.

For Segments 3 through 7, percent cover (herbaceous) data will be collected in late Summer 2013. Bank parameters / bank angle data will be collected in Spring 2014.

Tittabawassee River Bank Characteristic Survey Field Form

Segment Reach	Photo #	Date:	Observers:
Start GPS	End GPS	Right or Left Bank (circle) R L	

	Herbaceous Vegetation Cover (percent)	**Exposed Roots** (Low, Medium, High)	**Undercutting (Y/N)** (circle location and extent)	**Bank Height** (feet)	**Bankfull Height** (feet)
Above Bankfull			Mid-Bank Low Med High		
Below Bankfull			Toe Low Med High	**Additional Information**	

Visual Observation of Bank (circle one and indicate why)	High to Moderate Stability-	Low Stability	Undetermined -

Overstory Species (number at-risk by species)		**Understory Species** (shrubs)		**Herbaceous Species**	

NOTES: